Electrodeposition of High Surface Area Molybdenum Disulfide for use as a Hydrogen Evolution Catalyst

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ABSTRACT

Platinum (Pt) and Pt-based materials are known as the most efficient catalysts for the H_2 evolution reaction. However due to the cost of Pt-based materials, a continuous effort has been made to develop more commercially viable hydrogen evolution catalysts based on non-precious metals. Recently, molybdenum disulfide (MoS_2) has been identified as a good electrocatalyst for H_2 evolution in acidic media. More specifically only the Mo atoms exposed at the edge of the MoS_2 layer act as the active site for H^+ adsorption and subsequent electron transfer. However, MoS_2 has a two-dimensional layered structure and is usually prepared with a flat featureless morphology, minimizing the number of Mo atoms exposed on the surface edges. Therefore, it is highly advantageous to produce nanostructured MoS_2 to increase the number of Mo atoms exposed on the edges. In this paper we will present a new electrochemical strategy for porous MoS_2 electrode preparation. This method involves co-deposition of MoS_2 with Zn, where embedded Zn nanoparticles are later removed from the film. Linear sweep voltammetry and Tafel plots are used to characterize the morphology dependent electrocatalytic properties of MoS_2 films that will be discussed in this presentation.